Bureau of Standards,
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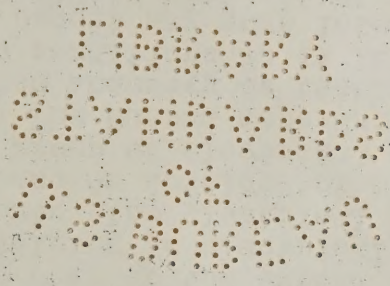
In accordance with the requests of several military bureaus to be kept informed as to the scientific and technical activities of the Bureau of Standards, as far as they relate to the military services, the Bureau has decided to issue periodic confidential statements to those bureaus regarding the progress of such work.

The Bureau believes that copies of these statements might well be placed in the hands of those officers and civilian employees having in charge technical and engineering problems of a type comprised in the appended outline or the applications of the same. To this end, the Bureau will be glad to receive from each department a list of the names to which it is desired that this information be sent, or if considered preferable, a statement of the number of copies which each office will arrange to circulate.

Suggestions regarding the form and scope of these bulletins will be gladly received, as the Bureau wishes to make them as useful as possible. Inquiries on any of the subjects treated or mentioned in them will at all times be given full and careful consideration.

The organization of the Bureau's scientific work is based upon the nature of the expert services required rather than upon the specific class of standards or materials to be investigated. This is clearly shown in the following outline of the divisions into which the scientific work of the Bureau is organized. That is to say, questions pertaining to electrical standards, electrical measuring instruments, the electrical properties of materials, and the performance or development of electrical devices, are referred to a group of electrical experts known as the electrical division. The Bureau depends to a large extent upon the experts of a given industry or technical service for information as to service conditions, as it is only by this method that the scientific expert may work intelligently; he cannot be expected to be acquainted with all of the applications of his particular branch of science any more than the technical expert or engineer, whether he be civil or military, can be acquainted with the latest developments in the field of science available for the solution of the problem in hand.

It is, therefore, exceedingly important at this time that, in utilizing the facilities of the Bureau, the military services adopt as far as possible the policy of designating in each important investigation or in the development of scientific devices for military purposes, some official thoroughly familiar with the field or service conditions involved, to whom the scientific experts of the Bureau may go for advice and cooperation.



To illustrate the general scope of the work being done at the Bureau of Standards, a statement is appended herewith showing the organization of its principal activities and typical examples of investigations, tests and researches falling within its several divisions.

OUTLINE OF THE WORK OF THE BUREAU OF STANDARDS

I. WEIGHTS AND MEASURES

Length, area, volume, mass, density, pressure, and time, including researches on units and standards, measuring methods and instruments, specifications and tolerances, and the standardization incident thereto for inspectors of weights and measures, manufacturers of measuring appliances, scientific and technical laboratories, Government bureaus, engineers, and the general public.

Examples: Testing and investigation of surveyors steel and invar tapes, and level rods, micrometer calipers, screw thread gages, limit gages, and munitions gages of every sort; planimeters; glass and metal volume standards, including burettes, pipettes, graduates, and liquid measuring pumps; weights, balances and commercial scales of every character, including railroad track scales; watches, chronometers and chronographs; density measuring instruments, including hydrometers and pycnometers; determinations of density and of the coefficient of thermal expansion of metals and other structural materials.

II. ELECTRICITY

Electromotive force, resistance, current, inductance, capacity, conductivity, insulation, magnetic permeability and hysteresis, and radioactivity, including researches on electrical units and standards, measuring instruments, and methods of measurement, and the cooperation with standardizing committees of technical societies, with testing laboratories, the electrical industries, public-service companies, and public-utility commissions, municipalities, and engineers upon problems of electrical standardization, including standards of adequacy and safety of electric service.

Examples: Testing and investigation of fuses, telephone receivers, transformers, radio circuits, insulating materials; magnetic testing of steel for soundness and hardness; determination of electrical resistance, conductivity, capacity and inductance, permeability, normal induction, hysteresis, etc.; determination of electrical illuminating standards and testing of electric lamps; measurement of radioactivity and of the brightness of self-luminous radioactive materials used in dials of aeronautical instruments.

III. HEAT AND THERMOMETRY.

Temperature, heat, heat constants, melting and boiling points, specific heats, conductivities, and other thermal pro-
critical points,

perties of materials, including researches on heat units and standard temperature scales, standardization of instruments and methods for measuring temperature, determination of refrigeration data and the fire-resisting properties of materials and other experimental work of specific value to the refrigerating and heating industries, in the manufacture of thermal appliances, in scientific testing laboratores, in fire-safety engineering, and in the industries and sciences requiring precise knowledge of temperature measurements and heat constants.

Examples: Testing and investigation of thermometers of mercury, alcohol, toluene, petroleum ether and pentane, electrical resistance thermometers, optical, radiation and expansion pyrometers and thermocouples; calorimeters; determination of melting and boiling points, of specific heat, of the heats of combustion, fusion and vaporization; determination of thermal conductivity and of the fire-resisting properties of materials; determination of the factors which govern the efficiency of radiators for internal combustion engines, especially as applied to automobiles and airplanes.

IV. LIGHT AND OPTICAL INSTRUMENTS.

Wave length of radiation (visible and invisible); color, relative emissivity, refelctivity, and absorption of materials for light and other radiation; transparency; and radiation constants, including experimental researches required in determining the optical constants of materials and of radiation; in developing optical standards of performance or quality of optiproducts for manufacturers, technical experts, and research laboratories; in the standardization and testing of sugar and other material by optical means; and in standardizing the measurement and specifications of colors for such industries as dyes, paints, ceramics, paper, inks, etc.

Examples: Testing and investigation of photometers, radiometers, spectrophotometers, polarimeters, lenses and prisms; of photographic apparatus, signal lights and colored glasses, reflectors and condensing lenses; optical systems for gun sights, periscopes, telescopes, range finders and projectors; special glasses for protecting the eyes from injurious radiations; determinations of color and its variations; of brightness and wave length, of radiant energy emission, of selective emission, reflection and absorption, of refractive indices; and of double refraction from strains, in optical materials.

V. CHEMISTRY.

Chemical composition and purity of material, chemical properties, and constants, including researches upon methods of analysis, specifications for technical materials, and preparation of pure materials for standardization work for the Government, and for industrial and scientific laboratories.

Examples: Chemical analysis and investigation of materials, including inks, adhesives, paper, rubber, rubber products and substitutes, textiles, and textile products, leather, oils and

greases, soaps; paints and paint materials, linseed oils, driers and thinners; determination of chemical properties including composition, purity, and the effects of impurities; stability, solubility, carbonization, resistance to corrosion; investigation of methods of analysis.

VI. ENGINEERING RESEARCH AND TESTING.

Operative efficiency of mechanical appliances, accuracy of engineering instruments, conditions affecting their effective use, e.g., structure and design as related to durability and efficiency; methods of standardization and test, standards of performance, and fundamental researches on the scientific principles involved in speedometers, pressure gages, water-current meters, anemometers, tachometers, gasoline and other motors, propellers, and other aeroplane parts and materials, etc.

Examples: Testing and investigation of fire extinguishers, vacuum cleaners, gasoline motors, pressure and vacuum gages and gage testing instruments, water-current meters, speedometers, tachometers and air-speed indicators; aeronautical instruments of every sort, including altimeters, inclinometers, velocity indicators and special pressure gages; investigation of special problems in the aeronautic engine, including the effect of high altitudes on efficiency and output, and the determination of the best fuels for aviation use.

VII. STRUCTURAL, ENGINEERING, AND MISCELLANEOUS MATERIALS.

Strength, hardness, elasticity, plasticity, permeability, composition, structure, and other physical and chemical properties of structural and miscellaneous materials, such as cement, stone, clay, lime, paper, textiles, rubber, etc., including laboratory and field work in developing methods of test, standards of quality, and the relation of quality to the efficient utilization of such materials.

Examples: Testing and investigation of steel and other structural materials for strength, hardness, abrasion and fatigue; determination of elasticity, elastic limit; testing and investigation of cement, sand and stone, clays and shale, brick, tile, porcelain and white-ware, fire clays and other refractories, pots and crucibles; mechanical rubber and leather goods; uniform cloths, airplane fabrics for wing covering, and other textile materials; and paper pulps and paper products.

VIII. METALLURGY.

Thermal analysis and structure of metals, heat treatment and its effect upon the properties of metals and alloys including the researches involved in determining the causes of metal failures, cooling and heating curves; the investigation of hardening, annealing, tempering, cementation; the determination of critical ranges; and the preparation of pure metals and alloys.

Examples: Testing and examination of pure metals and alloys in relation to their thermal and mechanical treatment, with es-

pecial reference at this time to the light alloys applicable to aeronautical construction; thermal and microscopic analysis, investigation of manufacturing processes and special metallic products, including rails, springs, fusible boiler plugs, structural bronzes and brasses, etc.

The above are illustrative of the Bureau's fields of activity and the problems which arise in them. In some of these cases the Bureau undertakes an exhaustive research of the problem as a whole; in others, essential features of the problems are worked out; while in others, the Bureau furnishes advice along scientific lines needed by the military services in the development of their own distinctive problems.

Respectfully,

S. W. STRATTON

Director.